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ABSTRACT

These four units of the Learning Activity Packages (LAPs) for individualized instruction in physical science cover nuclear reactions, alpha and beta particles, atomic radiation, medical use of nuclear energy, fission, fusion, simple machines, Newton's laws of motion, electricity, currents, electromagnetism, Oersted's experiment, sound, light, photosynthesis, and wave motion. Each unit contains a rationale for the material; a list of resources including texts, reading assignments, handouts, tape recordings, demonstrations, and science activities; suggestions for advanced study; and a list of behavioral objectives for the unit. Related physical science LAPs are SE 016 422 and SE 016 423. (CC)

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LAP

LEARNING
ACTIVITY
PACKAGE

ATOMIC
RADIATION

Ninety Six High School
Ninety Six, S.C.

PHYSICAL SCIENCE 93-94

REVIEWED BY

LAP NUMBER 8

WRITTEN BY G. J. Williams

SE 016 424

RATIONALE

In our last LAP we were concerned with the element carbon, its compounds and their uses, and its crystalline and amorphous forms.

In this LAP we will continue with some very interesting and important information about the radioactive elements. We have already covered information relative to the atomic structures for elements in previous LAP's. Therefore, it should not be difficult for you to understand this LAP on Atomic Radiation.

This LAP will deal with how radioactivity was discovered, names of some radioactive elements and the part of the atomic structure which is involved in the process of radioactivity. We will also be concerned with the types of radiation that is given off by radioactive elements, their different effects and their significance and harmfulness.

Our next LAP will deal with some general phases of physics, forces, motion, and machines.

SECTION I

Behavioral Objectives

Using the prescribed resources you will on the progress and/or LAP Test be able to:

1. Identify the three major particles of an atom and their position on or within an atomic structure.
2. Name the major part of an atom that is responsible for radiation or radioactivity.
3. State the incident which led to the discovery of radioactivity.
4. Identify the contributions which were made by the following scientists toward the study of radioactivity.
   a. Henri Becquerel
   b. Marie and Pierre Curie
   c. Konrad Roentgen
5. State the names of the three different types of radiation produced by radioactivity and how they differ from the other.
6. State the cause and nature of radioactivity.
7. Name an instrument which can be used to detect radiation and explain how it operates.
8. Name the two types of radiation that is harmful to the body.

RESOURCES

SECTION I

Modern Physical Science
Topic(s) The Discovery of Radioactivity
pages 420-426

World Book Encyclopedia
Topic(s) Radioactivity
page: 94-95 Volume 16

Physical Science - Work-A-Text
Topic(s) Nuclear Power
pages 119-122

Pathways in Science
Chemistry of Metals
Topics: 1. Does It Give Off Rays
pages 30-31
2. The Deathless Metal
page 136

Pathways in Science
The Materials of Nature
Topics: 1. The Discovery of Radium
page 150
2. How You Can Tell If an Element Is Radioactive
page 151

Science: A Key to the Future
Topics: 1. Discovery of Radioactivity
pages 56-58
2. Atomic Particles
pages 58-59
3. Transmuting Elements
page 62
4. Geiger Counters
page 66

HANDOUTS

1. Review sheet on Atomic Structure
2. Names of three different types of radiation and their definition.
3. Terms related to radioactivity to define.

TAPES AND AUDIOVISUALS

1. Teacher Lecture
2. Wollensak Teaching Tape "Structure of an Atom" (review only)

DEMONSTRATION

1. How to Use a Geiger Counter (if one is available)

FILMSTRIPS

1. Atoms and Atomic Energy
2. The Story of Radium

SELF-EVALUATION 1

GOAL

4 1. What contribution was made by the following scientist toward the study of radioactivity?

(a) Henri Becquerel _____

(b) Marie Curie _____

1 2. Name the three fundamental parts of an atomic structure:

a. _____ b. _____ c. _____

2 3. What are the two fundamental positions on an atomic structure?

a. _____ b. _____

2 4. Which of the two fundamental positions of an atomic structure is involved in the process of radioactivity?

_____

3 5. State the incident which led to the discovery of radioactivity.

_____

_____

5 6. Name the three different types of radiation which is given off by radioactive elements.

a. _____

b. _____

c. _____

8 7. List the names of the two types of radiation which will harm the body.

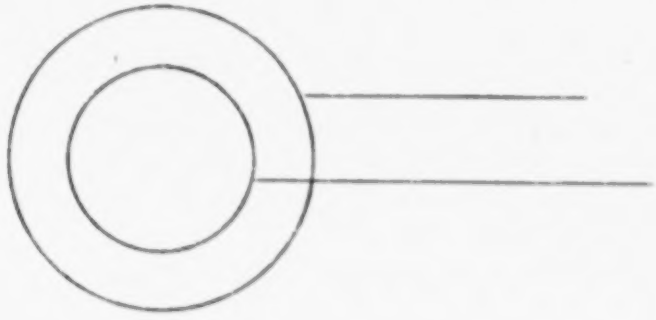
a. _____

b. _____

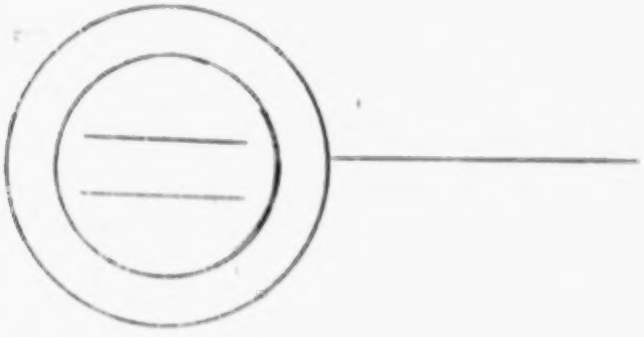
7 8. What is the name of an instrument which can be used to detect radiation?

_____

1 9. Label the positions in the following atomic structure diagram.



1 10. Place the three fundamental parts of an atom in their proper positions in or on this atomic diagram.



Advanced Study - Section I

1. Each term in the following list is in some way related to the Lap you are now studying on radioactivity. Each word suggests a concept. Compose a short summary of your understanding of these concepts. Try to use all of the terms in the list in your summary.

    1. Product Nuclei
    2. Radioisotope
    3. Tracer
    4. Cobalt - 60
    5. Lead - 206
    6. Carbon - 14
    7. Argon - 40

2. The heaviest atom that you can find in nature is Uranium-238. It has 92 protons in its nucleus, and 146 neutrons. How would you go about making even heavier atoms?
3. Compose a list of some of the things we enjoy now that would not be possible if it had not been for the discovery of radioactivity.
4. Explain why the disposal of radioactive wastes is an important problem and suggest two possible solutions for solving this problem.

Section II

Behavioral Objectives:

Using the prescribed resources you will on the progress and or/Lap test be able to:

1. State how a radioactive element is affected by losing an alpha or beta particles or gamma rays.
2. Write the symbol used for alpha beta and gamma rays.
3. Write equations for given nuclear reactions.
4. Determine by given equations the names of new elements formed when a given atom loses an alpha particle.
5. Determine by given equations the names of new elements formed when a given atom loses a beta particle.
6. State how elements can be changed into radioactive elements artificially.
7. Distinguish between natural radioactive elements and transuranium elements.
8. List the names of some natural radioactive and transuranium elements.

Resources - Section II

1. Modern Physical Science
   Topics: (1) Radioactivity Produces Three Kinds of Radiation
   page 451
   (2) What are Nuclear Equations
   page 424
   (3) Nuclear Energy
   page 425
   (4) Nuclear bombardment

2. Cambridge Work-A-Text
   Physical Science
   Topic: Radioactivity
   pages 127-128

3. World Book Encyclopedia
   Topic(s) Emission of Radiation
   page 94 - Volume 16

4. Science: A Key To The Future
   Topic(s) (1) Atomic Particles - page 58
   (2) Nuclear Symbols - pages - 59-60
   (3) Transmitting Elements - page 62

5. World Book Encyclopedia
   Topic(s) (1) Alpha Radiation - page 94 - Volume 16
   (2) Beta Radiation - page 94 - Volume 16
   (3) Gamma Radiation - page 95 - Volume 16

6. Energy And The Atom
   Topics (1) Alpha and Beta - page 307
   (2) Radioactive Elements - page 309
   (3) Nuclear Reactions - page 311

HANDOUTS

1. Symbols to classify according to type of radiation.
2. Equations to write and complete for nuclear reactions.
3. Elements to classify as either natural radioactive or transuranium elements.
4. Calculations on atoms losing alpha and beta particles.

TAPES AND AUDIOVISUALS

1. Lecture: Alpha, Beta and Gamma Particles

FILM AND FILMSTRIPS

1. Radioisotopes: Natural and Man Made
2. Radiation and its Practical Uses

TRANSPARENCY

1. Radioactivity (complete the student activities)

Resources - Section II (con't from p. 8)

Demonstration(s)

1. How to write equations for nuclear reactions.
2. How to determine the names of the new elements formed when a given element loses an alpha or beta particle.

Activities

1. Complete the Self-Testing Quiz on pages 312-313 in your textbook, Energy and the Atom.

2. Define the terms listed under "The Language of Science" - page 313 in your textbook, Energy and the Atom.

Self-Evaluation

Section II

GOAL

2 1. Write the symbol for the following types of radiation:

1. Alpha particle _____

2. Beta particle _____

3. Gamma Rays _____

1 2. State what happens when an element loses the following types of radiation.

1. Alpha particle _____

2. Beta particle _____

3. Gamma ray _____

6 3. Explain how an ordinary element can be changed into a radioactive element. _____

_____

7 4. What is the difference between the following terms:

Radioactive element _____

Transuranium element _____

8 5. List the names of five radioactive elements:

1. _____ 4. _____

2. _____ 5. _____

3. _____

8 6. List the names of five transuranium elements:

1. _____ 4. _____

2. _____ 5. _____

3. _____

3 7. Write the nuclear equation to represent the nuclear reaction which occurs when $_{92}U^{238}$ loses an alpha particle.

_____

3 8. Write the nuclear equation to represent the nuclear reaction which would occur if $_{6}C^{14}$ lost a beta particle :

_____

Advanced Study

Section II

1. List the names of the main parts of a nuclear reactor and the main function of each of these parts.

2. Write a comprehensive explanation on the causes of nuclear fission and fusion.

3. Write a summary on the use for the following instruments.
    1. Electroscope
    2. Geiger Counter
    3. Cloud Chamber
    4. Bubble Chamber

4. Complete the matching activity on pages 445-446 in the Modern Physical Science Book. (Check with the instructor about which ones to include).

5. Prepare a bulletin board on one of the following topics:

    1. Radioactivity - Advantages and Disadventages
    2. Radiation and its Effects
    3. Fission and Fusion

Section III

BEHAVIORAL OBJECTIVES:

Using the prescribed resources listed, you will on the Progress and/or Lap Test be able to:

1. Distinguish between nuclear fission and nuclear fusion and state examples for each.
2. Determine the names of new elements formed due to given nuclear fusion and nuclear fission reactions.
3. State contributions made by the following scientists:
    1. Otto Hahn
    2. Fritz Strassmann
    3. Enrico Fermi
    4. Lise Meitner
4. Distinguish between a nuclear reactor and a particle accelerator and their purposes.
5. State how scientists can make "New" isotopes and how these isotopes can be used.
6. List four harmful effects of radiation on plants and animals.
7. State two uses for nuclear energy in the following areas.
    1. Water supply
    2. Genetics
    3. Agriculture
    4. Medicine
    5. Transportation

Self-Evaluation

Section III

GOAL 1

1. Distinguish between the following terms:
   1. Nuclear Fission _____
   2. Nuclear Fusion _____

1 2. Give an example of an element which can be formed by Nuclear fusion _____

1 3. Give an example of an element which can be formed by nuclear fission _____

3 4. State the contribution which was made by the following scientist:
   1. Otto Hahn _____
   2. Lise Meitner _____

4 5. State for what the following machines might be used:
   1. Nuclear reactor _____
   _____
   2. Particle accelerator _____
   _____

6 6. What are some of the harmful effects of radiation on the following:
   1. Plants _____
   2. Animals _____

5 7. Explain how scientists can make a radioactive isotope.

5 8. List uses for radioactive isotopes.

Self-Evaluation - Section III (con't)

GOAL 5

9. How can nuclear energy be used in the following areas:

   1. Medicine

   2. Genetics

   3. Water Supply

1-7

10. Summarize what you have learned concerning nuclear energy.

Resources - Section III

1. Modern Physical Science
   Topics:
   1. What is Nuclear Fission
      pages 430-431
   2. Plutonium is also Fissionable
      page 434
   3. What is a nuclear reactor?
      page 433
   4. Uses for nuclear reactors
      page 435

2. Energy and the Atom
   Topics:
   1. Reactors and Accelerators
      pages 315-316
   2. Nuclear Fission
      pages 318-320
   3. Fusion
      pages 320-322

3. The Physical World
   Topics:
   1. Nuclear Reactors
      pages 216-219
   2. Making "New" Isotopes
      pages 227-228
   3. Uses of Man Made Atoms
      pages 229-230

4. Cambridge Work-A-Text
   Modern Physical Science
   Topics:
   1. Atomic Fusion
      pages 121-122
   2. Nuclear Reactors
      pages 120-121

5. HANDOUTS:

   1. Examples to classify as nuclear fission or nuclear fusion reactions.

   2. List of the parts of the nuclear reactor and state the function for each part.

   3. Areas to state how nuclear energy is helpful.

   4. A chart to complete on the similarities and differences between fission and fusion.

6. TAPES AND AUDIOVISUALS

   1. Lecture: Fission and Fusion

Resources - Section III - (con't from p. 16)

7. FILM AND FILMSTRIPS

1. Putting Atomic Energy to Work
2. New Power From the Atom
3. Making Atomic Energy Help Mankind

Activities

1. Complete the following activities as listed on pages 123-126 of the Physical Science Work-A-Text:
   (1) Completion questions
   (2) Multiple choice questions
   (3) Matching questions

Advanced Study

Section III

1. State the materials needed to make an H-Bomb and summarize how an H-Bomb is set off.

2. Name all the ways you can think of in which Einstein's formula $E=MC^2$ will probably affect your future.

3. Prepare a chart illustrating as many ways as you can in which fission differs from fusion.

4. Prepare a chart illustrating as many ways as you can in which fission is similar to fusion.

5. Each of the following terms listed is involved in some way with this LAP. Compose a short summary of your understanding of these concepts. Try to use all of the terms in the list in your summary.

   (1) Nuclear energy
   (2) Fusion
   (3) Fission
   (4) Hydrogen bomb
   (5) Fallout

6. Complete the completion questions, multiple choice questions and/or the matching questions on pages 133-136 in the Modern Physical Science Work-A-Text Book.

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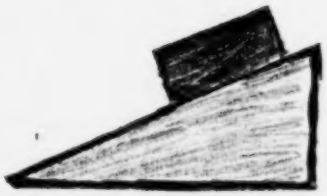
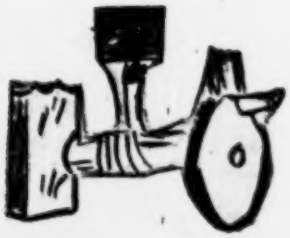
LEARNING ACTIVITY PACKAGE

SIMPLE MACHINES

FORCE

AND MOTION





Ninety Six High School
Ninety Six, S.C.

PHYSICAL SCIENCE 93-94

REVIEWED BY A.R.

LAP NUMBER 9

WRITTEN BY G. J. Williams

SE016 424

RATIONALE

In this Lap we will begin to venture into the study of physics. During the first semester, we concentrated our attention on chemistry, but physical science includes both the study of chemistry and physics.

This Lap will enable you to better understand the nature of force, motion and machines and their significance.

Can you list the names of the machines you have used since you started your day? Can you classify the machine that you used as simple or complex machines? Explain why you are hurled forward when you are riding and suddenly stop. Why is it that a racer in order to win a race, uses a light weight car and a powerful engine?

Upon completing this Lap, you will be able to effectively answer these and other questions.

Our next Lap will deal with another phase of physics.- magnetism and electricity.

Section I

BEHAVIORAL OBJECTIVES

Using the resources listed, you will on the progress and/or Lap test be able to:

1. Identify names, definitions and examples of different given kinds of forces.

2. Distinguish between and state examples for
   (a) vector quantities
   (b) scalar quantities

3. Construct force diagrams to represent given forces acting in same or opposite directions simultaneously.

4. Calculate the resultant of given forces acting in the same direction.

5. Calculate the resultant of given forces acting at right angles to each other.

6. Contrast the scientific and common meanings for the term work.

7. State formula and solve problems related to work.

8. Distinguish between the following terms (a) work and (b) power.

9. State the formula and solve problems related to power.

RESOURCES

1. Modern Physical Science

   Topics: 1. The Idea of Force
   pp. 182-183

   2. Force is a Vector Quantity
   pp. 183-184

   3. Constructing a Force Diagram
   pp. 184-185

   4. The Meaning of Work
   p. 224

   5. What is Power
   p. 225

2. Energy and the Atom

   Topics: 1. Work page 118

   2. Measuring Work - p. 119

   3. Power - p. 120

3. The Physical World

   Topics: 1. Work-page 39-40

   2. Work-page 293-294

   3. Measuring Work-page 293

4. Science: A Key to the Future

   Topics: 1. Scientific Meaning of Work - p. 50-51

   2. Doing Work - p. 51-52

5. Pathways in Science (Matter and Energy)

   Topics: 1. The Results of Several Forces - pp. 57-61

   2. The Meaning of Work - pp. 76-79

   3. The Meaning of Power - pp. 80-83

6. World Book Encyclopedia

   Topics: Work - p. 339

   Volume 20 - Book WXYZ

2 (cont't)

Resources con't

7. World Book Encyclopedia

Topic: Measuring Power - p. 653

Volume 15 - Book P

Handouts

1. Problems to Solve Related to Work
2. Problems to Solve Related to Power

Tapes and/or Filmstrip(s)

1. Lecture: General Information "The Scientific Meaning of Work"
2. Filmstrip: (1) Man's Use of Power
   (2) Energy and Work
   (3) Force and Motion

Transparencies

1. Work (complete the student activities)
2. Activities

   Using the General Science Programmed Learning Laboratory -

   Chapter I - Answer any 25 of the 63 given questions.

Self-Evaluation

1. List and define the names of three different kinds of forces.

   (1)

   (2)

   (3)

2. _____ are quantities which require both magnitude and direction for its complete description.

3. _____ are quantities which require only magnitude for its complete description.

4. Using a ruler, construct a force diagram to represent 15 lbs. acting eastward and 20 lbs. acting southward. Let each .1 of an inch represent one pound.

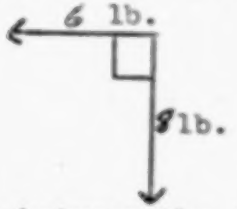
5. Calculate the resultant of these forces:

   (a)

   ans. _____

   (b)

   ans. _____

   (c) 

   ans. _____

6. Distinguish between the following terms:

   1. Work (Scientific definition)

   2. Power

7. Solve the following problems:
   A horizontal force of 110 lb. is required to move an object across the floor a distance of 20 ft. in 8 seconds.

   1. What is the amount of work done? _____

   2. What is the power required? _____

ADVANCED STUDY

1. Write explanations for the following concepts:
   (a) You do no work (according to the physicist) when you hold a ten pound carton motionless four feet from the ground. Why?
   (b) Why do you need a watch, a ruler, and a scale to measure the power you produce when running upstairs?
   (c) In what ways are windmills and waterwheels unsatisfactory as sources of power?
2. Suppose you know that a boy has done 90 foot-pounds of work in lifting a fish tank a distance of three feet. Show how the tank must be 30 pounds according to the work formula.
3. A load of five steel girders, each weighing three tons, is hoisted up 110 ft. Calculate the number of foot pounds of work done. Then compute the power developed if this work was performed in one minute and forty-five seconds.
4. Find the horsepower developed by an airplane that weighs forty tons if it climbs from 2,000 to 3,500 feet in one minute and ten seconds.

Section II

BEHAVIORAL OBJECTIVES:

Using the prescribed resources, you will on the progress and/or Lap test be able to:

1. Recite in writing Newton's three laws of motion.

2. State the significance of Sir Issac Newton formulating the three laws of motion.

3. Distinguish between the following terms:
   (1) positive acceleration
   (2) negative acceleration
   (1) speed
   (2) velocity

4. State how force and mass influences the amount of acceleration of a moving body.

5. Solve problems related to Newton's second law of motion.

6. Solve problems related to Newton's third law of motion.

7. List several everyday applications of Newton's second and third law of motion.

RESOURCES - Section II

1. Energy and the Atom

Topics; (1) Laws of Motion
pp. 115-117

2. Modern Physical Science

Topics: (1) Force and Motion - p. 194

(2) Newton's First Law of Motion
pp. 195-196

(3) Velocity and Acceleration
p. 196

(4) Newton's Second Law of Motion
pp. 196-197

(5) What is Newton's Third Law
pp. 198-201

3. The World Book Encyclopedia

Topics: (1) Motion - p. 700

(2) Velocity and Acceleration - p. 700

(3) Momentum - p. 700

(4) Newton's Laws of Motion - p. 700

Volume

4. The Modern Physical Science (Work-A-Text)

Topics: (1) Motion - p. 61

(2) Speed and Velocity - pp. 61-62

(3) Acceleration - p. 62

(4) Newton's Laws of Motion - pp. 62-64

Handouts or Activities:

1. Conditions to classify according to Newton's First, Second or Third Law of Motion.

2. Problems related to positive and negative acceleration.

3. Problems related to Newton's Third Law of Motion (Momentum).

Resources - Section II (con't from p. 8)

Tapes and Filmstrips:

1. Lecture and Demonstration - "How to Solve Problems Related to the Second and Third Law of Motion."
2. Filmstrip: Newton's Laws of Motion

Additional Activities:

1. Prepare a poster which displays examples of each of Newton's Three Laws of Motion.
2. Answer each of the following questions from pp. 124-125 in your textbook: 1, 4, 5, 7, 8, 9, and 10. (Pass in your answers to these questions).
3. Using the General Science Programmed Learning Laboratory, Chapter 2 - Answer any 10 questions from 64-138.

Self-Evaluation

Section II

1. Briefly explain why Sir Issac Newton formulated the three laws of motion.

2. What is the difference between positive acceleration and negative acceleration?

   Positive acceleration _____

   Negative acceleration _____

Solve the following problems:

3. An automobile is moving on a straight level road goes from 25 mph to 45 mph in 5 seconds. What is its acceleration? _____

4. Would the acceleration in the above problem be considered as positive or negative acceleration? _____

5. Your car is slowed down from 65 mph to 25 mph in 5 seconds. What is your deceleration in mph/sec ? _____

6. Would the acceleration in the above problem be considered as positive or negative acceleration? _____

7. What is the difference between the following terms:

   1. Speed

   2. Velocity

8. What are two factors which influence the amount of acceleration of a moving body? 1. _____

   2. _____

Self-Evaluation con't

9. List four everyday applications of the third law of motion.

   1.

   2.

   3.

   4.

Solve the following problem:

10. A gun having a mass of 5000 g fires a five gram-mass bullet at a speed of 1000 m/sec. Find the recoil velocity of the gun.

ADVANCED STUDY

1. Explain how Newton's Third Law of Motion is applied to the operation of jet engines and rockets.

2. Use simplified diagrams to show how Newton's Third Law of Motion is illustrated in walking, jumping and rowing.

3. Complete the completion questions 1-24 in the Modern Physical Science Work-A-Textbook - pages 65-66.

4. Complete the multiple choice questions 1-10, page 67, in the Work-A-Text Physical Science Book.

5. Complete the matching questions page 68 in the Modern Physical Science Work-A-Text, 1-10. (Write both Column A and Column B.)

6. Make a display of conditions which are explained by Newton's three laws of motion.

Section III

BEHAVIORAL OBJECTIVES:

Using the resources listed, you will on the progress and/or Lap test be able to:

1. Identify the names, description and definition for the six simple machines.

2. Differentiate between a complex and a simple machine.

3. List several common uses for given simple machines.

4. State how the three different types of levers are classified.

5. State the names of three different parts of a lever.

6. Classify given diagrams of levers as first, second or third class according to the position of the parts.

7. Classify given examples as first, second or third class levers. Example - The Seesaw - First Class Lever.

8. Solve assigned problems related to the incline plane, mechanical advantage and the lever.

RESOURCES - Section III

1. Modern Physical Science

Topic: (1) Machines - pp. 187-194

2. Energy and the Atom

Topics: (1) Machines - pp. 127-128

(2) Six Simple Machines - pp. 129-137

(3) The Lever - pp. 129-130

3. Modern Physical Science Work-A-Text

Topics: (1) Simple and Compound Machines - pp. 31-36

(2) The Lever - pp. 31-32

(3) The Classes of Levers - pp. 32-33

(4) The Law of Moments - pp. 33-34

4. Pathways in Science (Matter and Energy)

Topics: (1) A Lever is a Simple Machine- pp. 85-90

(2) Wheels and Axles - pp. 91-95

(3) Pulleys for Work and Power - pp. 96-100

(4) Ramps and Wedges - pp. 101-104

(5) Screws - pp. 106-114

5. The Physical World

Topics: (1) What is a Machine? - pp. 292-293

(2) All Levers are Machines - pp. 295-296

(3) Levers we Live With (Diagram illustrations) p. 296

(4) Other Simple Machines - pp. 299-300 (Study illustrations also)

6. Science: A Key to the Future

Topics: (1) Types and Purposes of Simple Machines pp. 82-94

(2) The Classes of Levers pp. 84-86

(3) Efficiency of Machines - pp. 92-94

Resources - Section III con't

7. The World Book Encyclopedia

Topic: (1) Six Simple Machines
pp. 13 - Volume 13, Book M

Handouts or Activities

1. Simple machine to identify
2. Machines to classify as simple or complex
3. Levers to classify as first, second or third class according to the position of the parts.
4. Everyday common examples of levers to classify as first, second or third class levers.
5. Problems to solve related to the first and second class of lever.
6. Problems to solve related to the incline plane and the mechanical advantage.

Tapes and Filmstrip(s)

1. Lecture: General Information on "Simple Machines"
2. Filmstrip(s): (1) Simple machines
(2) Incline Plane, Wedge Screw
(3) Pulleys Make Work Easier
3. Filmstrip w/ Teaching Tape: Simple Machines

Transparencies

1. Simple Machines (Complete Student Activity)
2. Levers (Complete Student Activity)
3. Types of Levers (Complete Student Activity)
4. Incline Plane (Complete Student Activity)
5. Complex Machines (Complete Student Activity)

Self-Evaluation - Section III

1. List the names of the six simple machines.

   1. 4.

   2. 5.

   3. 6.

2. What is the difference between a simple machine and a complex machine.

   (a) Simple machine

   (b) Complex Machine

3. State an example for the following:

   (a) Simple machine

   (b) Complex machine

4. List the names of three simple machines and tell what they are used for.

   1.

   2.

   3.

5. _____, _____, _____ are how the three classes of levers are classified.

6. Lable the three main parts of this lever.

7. Classify the lever in question 6, as first, second or third class lever. _____

8. Construct a diagram which represents a second class lever.

9. Classify the given examples as either first, second or third class levers:

   1. Scissors _____

   2. Wheelbarrow _____

(5 con't)

Self-Evaluation (cont' from page 15)

3. Seesaw_____

4. Shovel_____

5. Nutcracker_____

10. How much effort must be exerted on the handle of a wheelbarrow in order to lift a force of 200 lbs. if the distance from the wheel to the weight is 2 ft. and the distance from the wheel to the handle is 5 ft.?

11. How far from the fulcrum must a boy who weighs 5 lbs. sit, in order to balance a 50 lb. boy who sits 1 ft. from the fulcrum and another boy who weighs 25 lbs. and sits 2 ft. from the fulcrum?

12. A 150 lb. boy is sitting 2 ft. from the fulcrum of a seesaw and a 100 lb. boy sits 3 ft. from the fulcrum. Is the seesaw balanced?

Advanced Study

1. Make a list of all the simple machines you can find in your home. Describe the machine.

2. Finish the story by choosing the words from the list below. Simple machines may be combined to form (1) machines. No matter how good a machine is its (2) is never perfect. The machine wastes work through (3) and (4). But we know that rolling (5) friction. The formula for efficiency divides (6) by (7) and the answer is in (8).

element	output	input
efficiency	compound	percent
friction	reduces	
increases	heat	

3. Make a display showing examples of some common levers we use everyday. Classify the levers as first, second or third class.

4. Write a summary composed of the pros and cons of a perpetual motion machine.

ED 086478

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

LEARNING ACTIVITY PACKAGE

MAGNETISM AND ELECTRICITY

Ninety Six High School
Ninety Six, S.C. 1001

Physical Science 93-94

REVISED BY

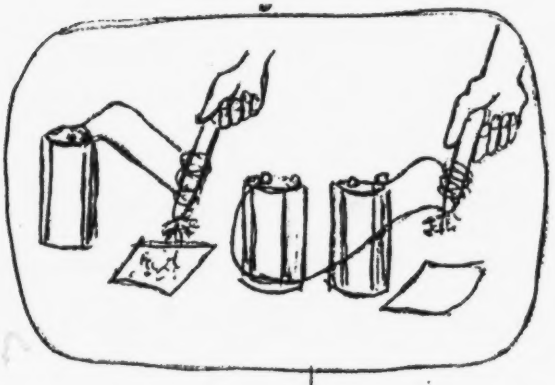
LAP NUMBER 10

WRITTEN BY C. J. Williams

SE 016 424

RATIONALE

WHY?



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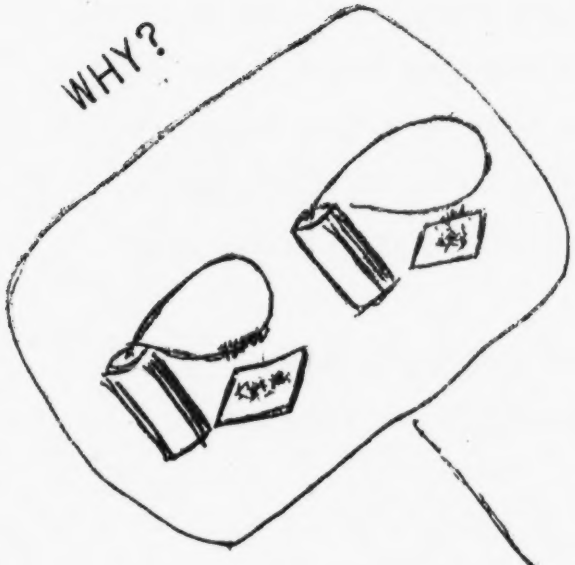

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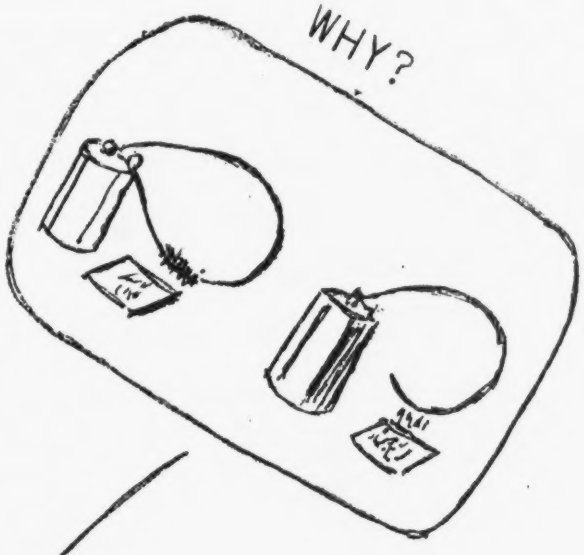


MAGNETISM and ELECTRICITY

Rationale

In this LAP we will continue with the Physics Phase of Physical Science. You have just completed a LAP on Force Motion and Machines and we will continue with the study of specific kinds of forces; the forces of electricity and magnetism.

This LAP is concerned with the general nature of electricity and magnetism, how to solve problems related to rate of flow pressure and amount of resistance to the flow of electric current. You will also learn how to read an electric meter. In our study of magnetism we will consider the law of poles, magnetic and nonmagnetic materials, how to make an electromagnet and the relationship between electricity and magnetism.

Our next LAP will venture into the realm of Biophysics--The study of light and how we see and sound and how we hear. This will be your final LAP for Physical Science.

Section I

Behavioral Objectives:

Using the prescribed resources you will on the progress and or LAP Test be able to:

1. State the scientific meaning for the terms electricity, electric current and electric circuit.
2. List the names and differences between the two different types of electrical charges.
3. Demonstrate how we can create static electrical charges.
4. State the differences between neutral, positive and negative charged particles.
5. Demonstrate how electrical charges can be detected.
6. List several practical uses for electricity.
7. State how electricity travels and three factors which influences the flow of an electric current.
8. List and define the names of the three basic units used to measure the flow of an electric current.
9. Differentiate between and list examples for each of the following.
   a. conductors
   b. insulators
10. Demonstrate how to read an electric meter.
11. State what an electric meter is used to measure.
12. Construct and read given electrical meter diagrams.

Resources Section I

1. The Physical world

   Topics 1. Simple Electricity- page 119
   2. Charge It Charge It! Glass Charge It!- Rubber, Charge It!- Class and Rubber - page 371-372
   3. Two charges: Two Electricities page 373-374

2. Modern Physical Science

   Topics 1. What is electricity pages 344-345
   2. Resistance Affects Current flow pages 347-348
   3. How many electric appliances are found in homes? pages 369-370

3. Pathways In Science (The Forces of Nature)

   Topics 1. Conductors Resist the Flow of Electrons pages 30-32
   2. Conductors and Insulators page 11
   3. The Properties of a Wire Affects Its Resistance pages 35-38

4. Cambridge Work-A-Text

   Topics 1. Static Electricity page 69-70
   2. Current Electricity page 70-71

5. Science: A Key To The Future

   Topic 1. Electricity pages 31-33
   2. Kinds of Electrical Charges 33-34
   (Perform the experiment on page 30)

6. The World Book Encyclopedia

   Book E Volume 6
   Topics 1. Electricity page 146
   2. Basic Principles of Electricity page 147
   3. Static Electricity page 148
   4. Current Electricity page 148-149

Handouts I. General Information About Electricity

II. Terms to define related to electricity
III. Electric Meter diagrams to read
IV. Electric meters to construct with given readings

Tapes and Audio Visuals

Tape: Lecture "Introduction to Electricity
Filmstrip: Electricity

Activities

I. Complete the answers to the questions under the following topics in the Physical World Textbook

   (a) Questions in review Questions 1-3 page 377-378

   (b) Questions for extended view Questions 1-8 page 378

II. Complete the answers to the completion questions in the Cambridge Work-A-Text page 77 questions 1-10

III. Read given Electric Meter diagrams.

IV. Construct electric meter diagrams which represents given meter readings.

Experiment

Directions and procedures listed on page 119 of the Physical World Textbook.

Additional Activities

(Transparencies) Complete

1. Conductors and Nonconductors (student activities)
2. Attraction and Repulsion of Charges (student activities)
3. Current Electricity (student activities)
4. Static Electricity (student activities)
5. Pathway of Electricity (circuits-student activities)
6. Series and Parallel Circuit (student activities)
7. Switches and Fuses (student activities)

Self Evaluation Section I

1. Write a brief difinition for the following terms:

   1. Electricity

   2. Current electricity

   3. Static electricity

   4. Conductor

   6. Insulator

2. What is the difference between and state an example for each of the following:

   1. Current electricity

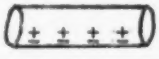
   2. Static electricity

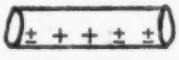
3. List two examples for each of the following:

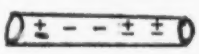
   1. Insulators (1) (2)

   2. Conductors (1) (2)

4. Identify the following rods as being neutral, positive or negatively charged.

   (a)  answer_____

   (b)  answer_____

   (c)  answer_____

5. List 10 practical uses for electricity.

   1. 6.

   2. 7.

   3. 8.

   4. 9.

   5. 10.

6. Name the name of an instrument which can be used to detect electrical charges.

   _____

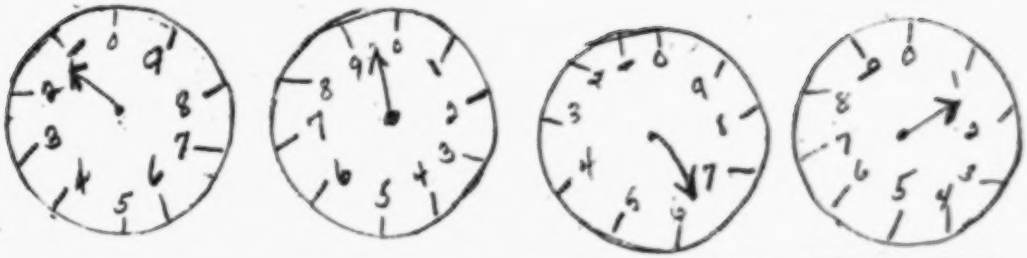
7. How can you create positive and negative charges on objects?_____

8. List two factors which influences the rate at which electric current flows.

   1. 2.

Self-Evaluation (cont')

9. Read the following meters



10. Construct meters to read as follows

7 8 6 1

Advanced Study

Section I

1. Write a summary explaining two ways electricity can be produced.

2. Select one of the following topics and make a report (Use at least four different references)

   (1) Electric sign

   (2) Electrician

   (3) Electric Wiring

   (4) Electric Power

   (5) The History of Electricity

3. Each term in the following list is a key word or phase in the study of electricity. Compose a short summary of your understanding of these concepts.

   1. charge
   2. Electroscope
   3. Lightning rod
   4. Lightning
   5. Insulator
   6. Conductor
   7. Static charge
   8. Current electricity

4. Prepare a display which shows the significance of electricity.

EXPERIMENT I

Section I

Simple Electricity- Static Electricity

Using the directions given on page 119 of the Physical World Book

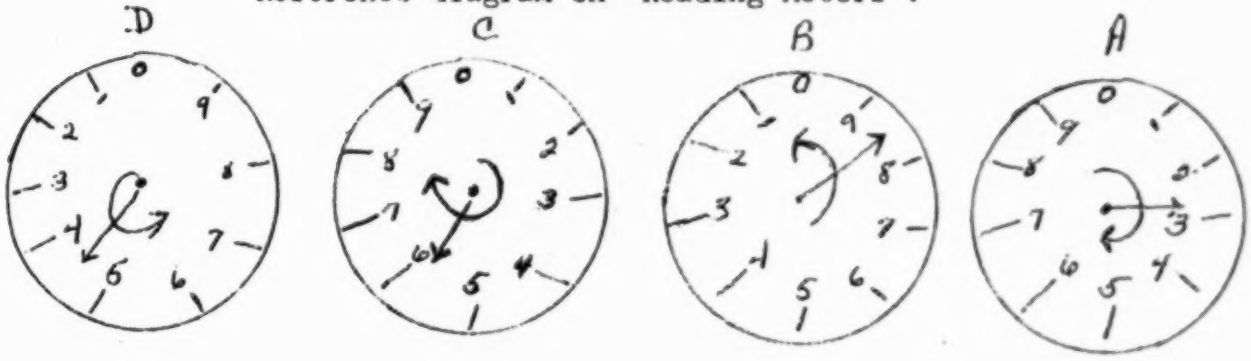
Perform the experiment under the title -- Simple Electricity.

Conclusion:

Why are the charged rods in the third diagram attracted while the charged rods in the first two diagrams are repelled?

Explain your answers.

Reference diagram on "Reading Meters":

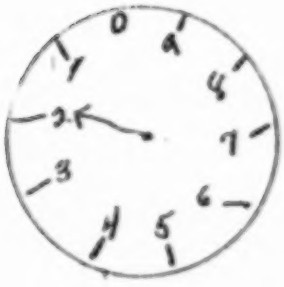


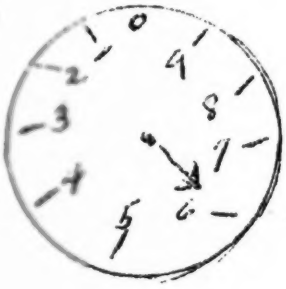
Note: Electric meter dials read, from right to left, in units of ones, tens, hundreds, and thousands. Dial A's pointer must make a complete revolution for dial B's to move ahead one unit, and so on down the line.

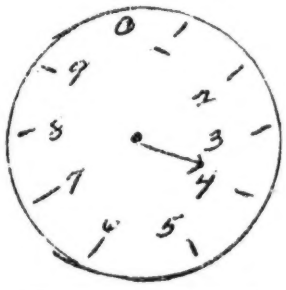
The hand on the extreme right turns clockwise, the next hand turns counterclockwise, the next turns clockwise, and the last hand on the left turns counterclockwise.

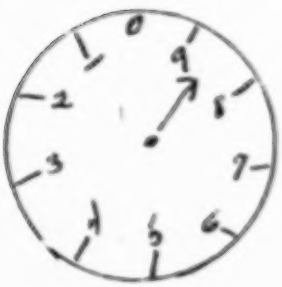
To read each dial, you use the number last passed by the dial hand. This may not be nearest the hand. For instance, if the pointer has passed 6 and is almost on 7, you read it as 6. Write down the figures in the same order you read the dial, from right to left.

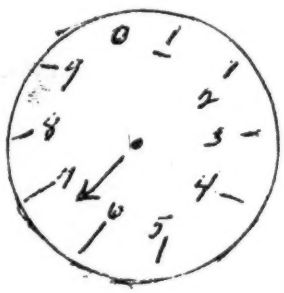
Practice reading the following meters.

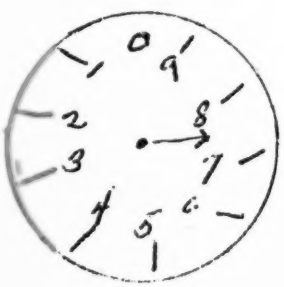


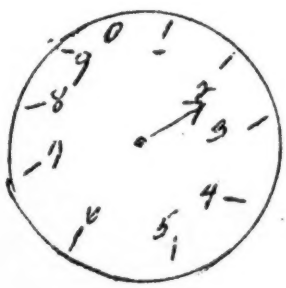




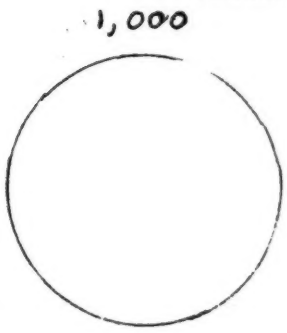








Complete the meters so that they will show the following readings:



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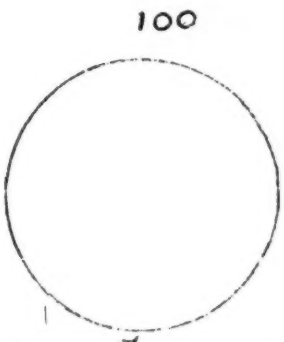

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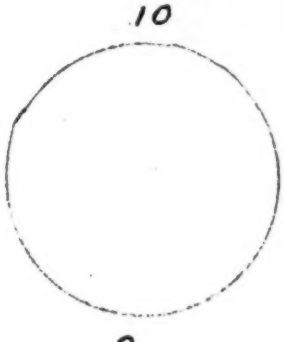

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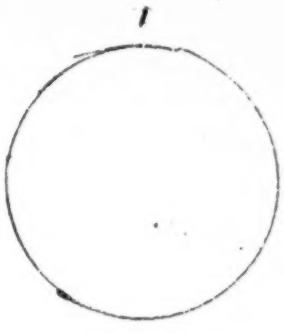

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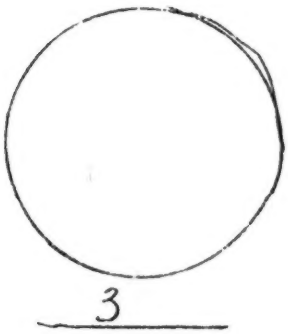

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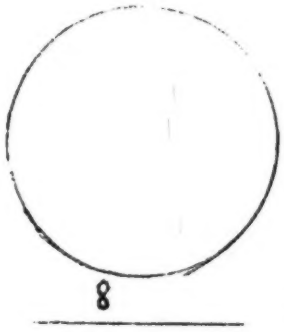

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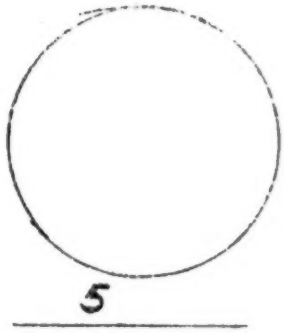

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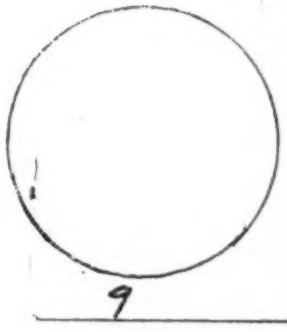

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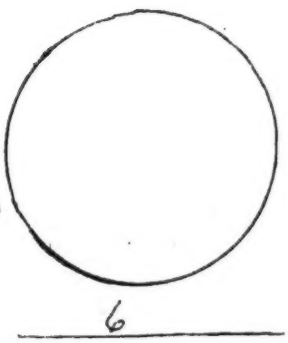

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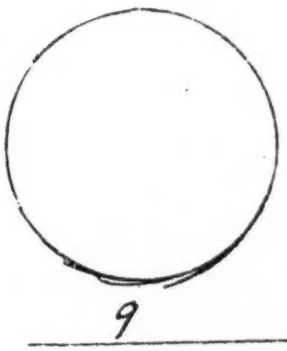

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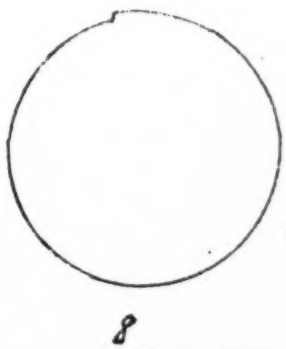

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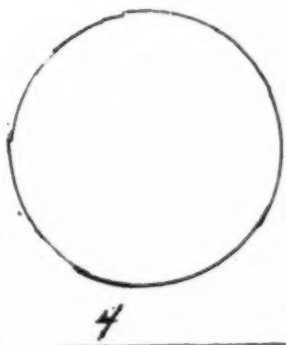

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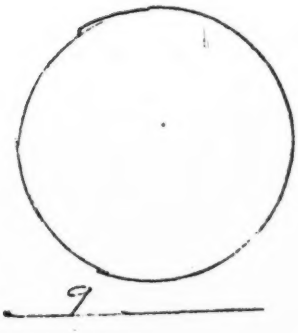

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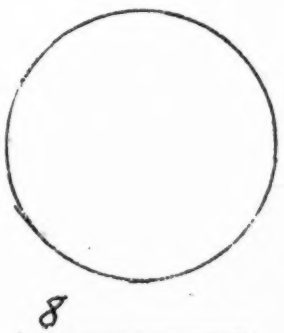

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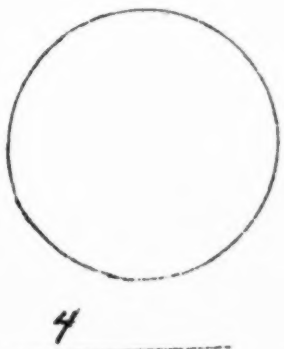

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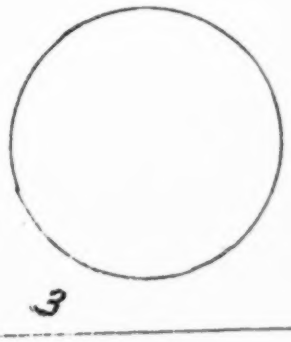

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Section II

Behavioral Objectives:

Using the prescribed resources you will on the progress and or LAP Test be able to:

1. State how the following terms are related to the flow of electric current.
   1. Volt
   2. Ampere
   3. Ohm
2. State Ohm's Law
3. Identify the symbols which are used to denote the following electrical units.
   1. volt
   2. current
   3. resistance
4. State the formula and solve problems related to the following.
   1. Rate of current flow (amperes)
   2. Resistance (ohms)
   3. Voltage (volts)
5. Distinguish between the following terms:

   (a) parallel circuit — (c) direct currnet

   (b) series circuit — (d) alternating current
6. Demonstrate how to set up a parallel and a series circuit using batteries bell wire and small lamps.
7. List several advantages for using a parallel circuit.
8. Distinguish between the following:

   (a) open circuit — (a) switch — (a) short circuit

   (b) closed circuit — (b) fuse — (b) shortage
9. State the purpose of the following in relation to electricity.
   1. circuit
   2. switch
   3. fuse
   4. socket
   5. electric wire

Procedures for connecting lamps in series and in parallel circuits.

You will find the procedures to follow in the book entitled "Physical Science For Progress" page 313- Resistors In Series and page 314- Resistors In Parallel.

NOTE: Make a sketch of each of the different connections, then procede to connect the lamps in series and in parallel connections.

AFTERWARDS

Answer the questions on the following page concerning your experiment.

Conclusions

From the experiment on connecting lamps in parallel and series.

1. Make a sketch of the set up for your parallel circuit.

2. Make a sketch of the set up for a series circuit.

Questions:

1. How does the set up for the parallel cirucit differ from the series circuit?

2. What happens when you unscrew one of the lamps in the parallel circuit?

3. What happened when you unscrewed one of the lamps in the series circuit?

4. As you continued to add lamps in the parallel circuit what happened to the brightness of the light? Why?

5. As you continued to add lamps in the series circuit what happened to the brightness of the light? Why?

6. What is the advantage of using parallel circuit in public buildings?

7. What is the type of circuit used:
   (a) in your home?
   (b) in your school?

8. What is the disadvantage of using series circuits?

9. What happens usually when you unscrew one of the light bulbs from a set of Christmas tree lights? Why?

Resources

Section II

1. Pathways In Science (Forces of Nature)

   Topics 1. How to Increase Current and Voltage pages 40-41
   2. The Resistance of a Circuit pages 44-47
   3. The Series Circuit pages 18-20
   4. Why Did The Fuse Blow pages 21-22
   5. Parallel Circuits pages 24-28
   6. Ohm's Law pages 46-47

2. The Physical World

   Topics 1. Measuring Electricity Ohm's Law page 385-386
   2. Solving Problesm Within The Concept pages 395-396

3. Modern Physical Science

   Topics 1. What is meant by short circuit page 355
   2. Fuses and circuit breakers are safety devices pages 355-356
   3. What is a series circuit page 356
   4. Parallel Circuit page 357

4. Energy and the Atom

   Topics 1. Measuring Electric Current page 158
   2. Volts and Voltage page 158-159
   3. Amperes and Amperage page 159
   4. Resistance pages 159-160
   5. Ohm's Law page 160-161

5. Cambridge Work-A-Text Physical Science

   Topics 1. Units Used to Measure Electricity page 71
   2. Ohm's Law page 71-72
   3. Electrical Circuits page 72-74
   (a) Series Circuit page 72-73
   (b) Parallel Circuits page 73-74

Handouts

I. Terms to define relate to this section
II. Formulas to learn to calculate current,resistance and volts problems.
III. Problems to solve related to calculating the following:
(a) current (b) resistance (c) voltage

Tapes and Audio Visuals
1. Tape: Lecture "Units Used to Measure Electricity

Activities

1. Learn symbols and formulas and solve problems related to current, resistance and voltage

2. Demonstrate using bell wire, batteries and small lamps how to connect up a series and a parallel circuit.

3. Using the Modern Physical Science text book- Answer questions 3,5,8,9 and 12 on page 358.

4. Using the Work-A-Text Physical Science pages 78-79 answer the following questions 13,14-a,b,c,d and e and 15-a,b,c,d,e and f.

Experiment

I. Connect lamp in parallel and series circuits.

Transparencies (In Resource Center- United Transparencies)

* Ohm's Law- SC-802

* Ohm's Illustration- SC-803

Watts- SC 804

Watts Illustration- SC-805

Series Circuit- SC 807

Parallel Circuit-SC-808

Section III

Behavioral Objectives:

Using the prescribed resources you will on the Progress and/or LAP Test be able to:

1. List the names of the two major poles on a magnet.
2. State the law of poles of a magnet.
3. Demonstrate the characteristics of magnetic attraction(Include the area of greatest attraction.
4. Classify the names of given magnets according to shape and description.
5. Differentiate between a permanent and a temporary magnet.
6. Demonstrate how we can make a temporary and a permanent magnet.
7. Demonstrate how lines of force created by magnetic attraction appears when like and unlike poles are placed together.
8. State the basic part of an atomic structure which is most involved in magnetism.
9. Classify given materials as either magnetic or nonmagnetic materials.
10. Demonstrate the fact there are some materials that are magnetic and some that are not.
11. State the meaning for the term magnetic field.
12. State how a magnetized material can be demagnetized.

Resources

1. Energy and the Atom
   Topic 1. Magnetism and Electricity pages 145-146
   2. Magnets page 147
   3. Poles of Magnets 147-148
   4. Magnetic Fields pages 148-149
   5. Electron Spin page 150
   6. Magnetic Domains pages 150-151

2. Modern Physical Science
   Topic 1. What is a Magnet? page 358
   2. Magnetic Poles page 358-359
   3. How does iron become a magnet page 359
   4. What is a Magnetic Field? page 360

3. Science: A Key to the Future
   Topic 1. Magnetic Fields page 145-146
   2. Magnetic Field Between Opposite Magnetic Poles page 146

4. The Physical World
   Topic 1. Magnetism page 376
   2. Magnets and Magnetism page 377
   3. Law of Magnetism page 377
   4. Magnetic Fields page 13
   5. The Wandering Poles page 13-14

5. Pathways In Science (The Forces of Nature)

   Topic 1. Which Materials Are Magnetic?
   2. Where Is A Magnet's Greatest Strength? page 62
   3. Magnetic Poles page 63
   4. The Law of Magnets page 63
   5. How Magnetism Is Explained page 68-72
   6. Making a Magnet page 72-74
   7. Magnetic Fields pages 76-77

Handouts
I. Worksheets
   I. "What Did You Learn?"
   II. General Information About Magnets

Tapes- Audio Visuals
Eye Gate Teach-A-Tape Cassette Magnetism and Electricity
Filmstrip W/Tape No. 176-H

Filmstrips
1. What is Magnetism?
2. Magnets

Experiments Related to Magnetism
1. See A Magnetic Field
2. Make An Electro-Magnet
3. See How They Attract and Repel
4. Make a Permanent Magnet
5. Make Many From One

Experiment Section III

Demonstration I

"See" a Magnetic Field

Cover the permanent magnet with a glass cover(if not successful, use a sheet of paper). Sprinkle iron filings on the paper. Tap the paper and note the patter formed. Strings or lines of filings pass from one pole of the magnet to the other. The area covered by the filings is the center of the magnetic field. To remember this, you might compare the magnetic lines of force that arrange the iron filings to the contour strips in a farmer's field.

Demonstration II

Make an Electro-Magnet

You can make magnetism work for you by winding several turns of insulated wire around one or more large nails or spikes (soft iron). Connect one end of the wire to the battery. Touch the other end of the wire to the other terminal for a few seconds and see how many tacks you can pick up. Repeat the experiment using as many turns as possible. How many more tacks were you able to pick up?

You have made what we call an electromagnet. When you disconnect the wire, the nails fall off. This is one of the advantages of an electromagnet. We can turn magnetism on and off as we wish. Picture a crane operator throwing the switch and picking up scrap iron and steel. Then he opens the switch and drops the scrap metals.

Soft iron can be magnetized easily as you have just seen, but loses it magnetism in a short time. Steel is harder to magnetize but holds its magnetism almost indefinitely.

Demonstration III

See How They Attract and Repel

Take one of the magnetized needles and hang it with a thread. A thread stirrup will help keep it level. Be sure it is not near other large pieces of steel. Watch the needle. Does it settle down, pointing in one Direction? (Check to see if this is the same direction as your compass). If it does, you have made a compass. The tip of the needle pointing north is called the North Pole (North-seeking pole). The other end is called the South Pole. Mark the North Pole with a stroke of the red marking pencil. Mark the South Pole black. Do the same thing with the second needle. You can show this with a sewing needle, and notched cork, and a bowl of water. Rest the needle in the notched cork, and float it on the water.

Experiment Section III

Demonstration IV

Make a Permanent Magnet

Wrap the insulated wire around the steel knitting needle. The wire should be wrapped the full length of the needle. One end of the wire is connected to the battery. The other end of the wire is then touched for just a few seconds to the other terminal. This should make the needle into a permanent bar magnet. If you did not get results, try two batteries in series, wind more turns of wire on the needle, and leave it connected a little longer. Do the same thing with the second knitting needle. In the same way, you can magnetize a screwdriver, so that you can use it to pick up and hold steel screws. Don't do it unless you want your screwdriver to be magnetized.

Demonstration V

Make Many From One

This demonstration is on a page by itself. The page follows this one.

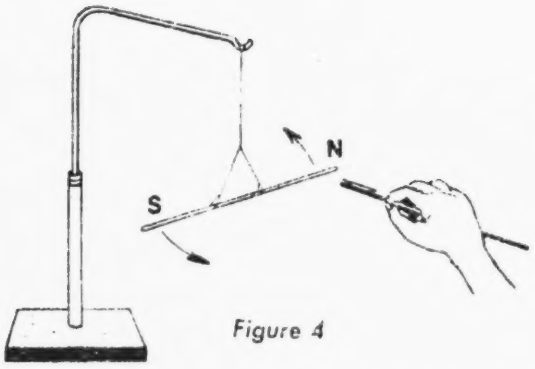


Figure 4

Hold the compass near the North Pole of the needle. What happens? Does the South Pole of the needle attract the North or South Pole of the compass? Try this with the second magnetized needle. See if you can prove the rule that like poles repel (drive away) and unlike poles attract.

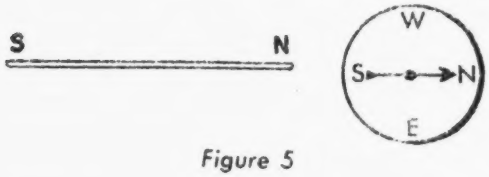
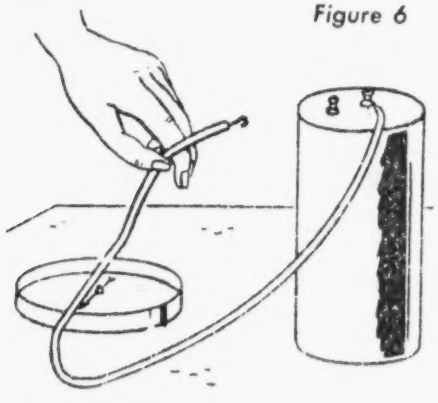


Figure 5

Connect one end of a wire loop to the battery and run the wire directly over the compass. Touch the other end of the wire to the battery. Which way does the compass point now? If you get some motion out of the compass needle, this proves there is a magnetic field around the wire when current is flowing. This relation between electricity and magnetism is the thing that makes electric motors and generators work.

Figure 6



Make Many From One

Lay the third needle (unmagnetized) on a table and stroke it with one of the magnetized needles. (See diagram) Always stroke it in the same direction. Raise the magnetized needle at least two inches on each return stroke. Thus you can magnetize the needle by using the other needle.

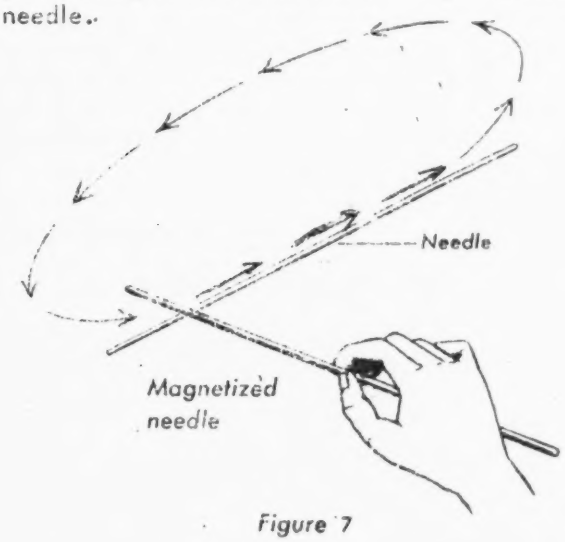
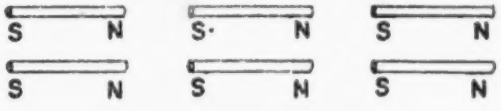


Figure 7

Use the wire cutters to cut the first magnetized needle in short lengths. (Cover the needle with a cloth to keep the pieces from flying.) Can you show by using the compass that each piece is a complete magnet? Hold one end, then the other, of each piece to a compass. Does each piece have both a North and South Pole?

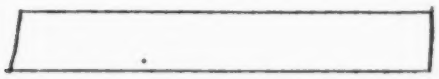


Magnetism and Animals

The things you have done show that electricity and magnetism are related in many ways. Magnetism is mysterious, and there are still things to discover about it. It is thought that animals and birds are aided in their sense of direction by magnetism. It is commonly known that when a person gets lost in the woods, he tends to go around in circles. Possibly this is caused by the earth's magnetic field.

Self-Evaluation

1. Label the two major poles on a magnet:



2. State the "Law of Poles"

3. Name the point of greatest attraction on a magnet.

4. What is the difference between a permanent and a temporary magnet.

   (a)

   (b)

5. State how you can determine which is north and south pole of an unmarked magnet?

6. How can you detect the fact that you have two like poles and an unmarked magnet together? Unlike poles together?

7. What atomic particle is responsible for magnetism?

8. What is meant by the term magnetic field?

9. Name three different kinds of magnets.

   1._____ 2._____ 3._____

10. Classify the following materials as either magnetic or nonmagnetic.

    1. Brass tacks_____
    2. Glass rod_____
    3. Rubber tubing_____
    4. Paper clips_____
    5. Paper_____

11. What accounts for the fact that some materials are magnetic while some are not?

12. Make a sketch which shows how lines of force appear when (a) like poles on a magnet are together, (b) unlike poles on a magnet are together.

Advanced Study

1. Write an explanation of how a permanent magnet functions in a generator.

2. Explain what is meant by the statement "Changes the polarity of the poles."

3. Write a report on the "Discovery of the First Natural Magnet." (Use several different references)

4. From the list select the magnetic and the nonmagnetic materials. Explain why the materials named as nonmagnetic is(are) magnetic:

   1. Cobalt

   2. Nickle

   3. Germanium

5. Explain with diagrams and illustrations what is meant by "Magnetic Domains"

Section IV

Behavioral Objectives:

Using the prescribed resources you will on the Progress and/or LAP test be able to:

1. Distinguish between the following terms:

   (a) Electromagnet

   (b) Electromagnetism

2. State the two basic principles of electromagnetism.

3. Demonstrate how we can make an electromagnet.

4. State how magnetism and electricity are related.

5. State the contribution of the following toward the study of electromagnetism.

   A. Michael Faraday

   B. Joseph Henry

   C. Hans Oersted

6. List several common uses for an electromagnet.

7. Demonstrate how to use a galvanometer and state what it can be used to detect.

8. Demonstrate how we can create electromagnetic induction.

9. Using pages 153 -154 in your text book (Energy and The Atom) complete the following data:

   1. Purpose of the experiment

   2. How you can induce a current

   3. Role of the following equipment in the experiment.

      (a) Bell Wire

      (b) Galvanometer

10. State factors which affects the strength of an electromagnet

Resources Section IV

1. The Physical World
   Topic 1. Electricity From Magnetism page 386
   2. The Galvanometer page 386-387
   3. What Oersted Was Looking For page 387
   4. Putting the Electromagnet to Work page 389
   5. Electricity From Induction page 391

2. Science: A Key To The Future
   Topic 1. Magnetism From Electricity pages 237-238
   2. Electromagnets page 238

3. Modern Physical Science
   Topis 1. The Electric Current Produces Magnetism pages 361-362
   2. Electromagnets Can Be Very Powerful pages 362-363
   3. What is Electromagnetic Induction? page 363-364

4. Energy And The Atom
   Topic 1. Electromagnetism page 152
   2. Electromagnetic Induction page 153
   3. Inducing Current page 153-154

5. Pathways In Science (The Forces of Nature)
   Topics 1. Magnetism and Electricity page 90-94
   2. The Electromagnet Goes to Work pages 96-100
   3. Electricity From Magnetism page 103-105

6. Cambridge Work-A-Text Physical Science
   Topic 1. Theory of Magnetism page 81-82
   2. Electromagnet page 82
   3. Making An Electromagnet page 82

Handouts

1. List of Terms related to the study of electromagnetism
2. Work Sheet- General information about electromagnetism

Tapes and Audio Visuals
Eye Gate Teach-A-Tape w/ cassette Electromagnetism

Activities
1. Complete the Self Test on page 162-163 of your text book Energy and The Atom Questions 1-12
2. Use the Work-A-Text Physical Science text book page 87-88 under completion questions, answer the following questions 1,2,3,4,5,6,7,8, 10,12 and 23.

Self-Evaluation

1. Differentiate between the following terms.

   a. electromagnet

   b. electromagnetism

2. List two uses for an electromagnet:

   1

   2

3. What was the purpose of Oersted's experiment?

4. State the contribution made by the following scientists toward electricity and magnetism:

   1. Joseph Henry

   2. Hans Oersted

   3. Michael Faraday

5. Explain how you can:
   (a) Induce an electric current

   (b) Make an electromagnet

6. Name an instrument which can be used to detect an electric current.

7. List two factors which affects the strength of an electromagnet.

   1.

   2.

8. What is meant by electromagnetic induction?

9. In Oersted's experiment what was the purpose for the following equipment?

   1. Bell Wire 2. Compass 3. Magnet

10. How can you increase or decrease the strength of an electromagnet?

INCREASE THE STRENGTH	DECREASE THE STRENGTH
1.	1.
2.	2.
3.	3.
4.	4.

Advanced Study

1. Write a summary on several ways to demagnetize a magnetized magnet.

2. Prepare a report using several resources on the topic "Alnico"

3. Prepare a summary on how the following operate in relation to electromagnetism.
   (a) Transformers
   (b) Electric Generators

4. Prepare a chart which displays the similarities and differences between electricity and magnetism and summarize their relationship .

5. Write a summary on how a magnetic field is similar to a gravitational field.

6. Explain how the sun influences the magnetosphere.

Experiment Section IV

Making a magnet from a coil

"Electromagnetism"

Procedure

Wind a coil of ten turns of wire around an iron nail about 4 inches long. The nail is the core, or inside, of the coil. Leave three or four inches of wire on each end of the coil. Connect the coil in series with a switch to a dry cell. Try picking up some paper clips both before and after closing the switch.

State when you are able to pick up the clips: With the switch

Open_____ or closed_____

Why?_____

How can you increase the number of paper clips being picked up?

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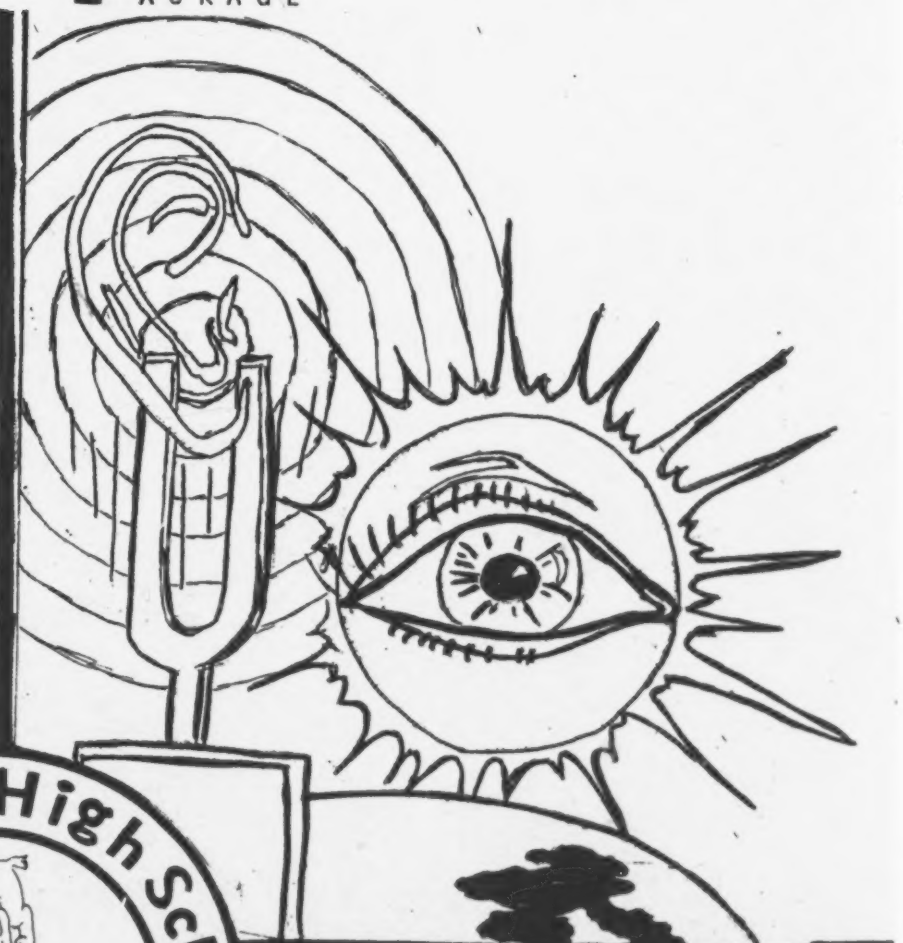
LAP

LEARNING ACTIVITY PACKAGE

SOUND AND LIGHT



Ninety Six High School
Ninety Six, S.C.

PHYSICAL SCIENCE 93-94

REVIEWED BY S. Ritchie

LAP NUMBER 11

WRITTEN BY G. J. Williams

SE 016 432

 32472

Rationale

We are entering the last phase of our interesting adventure through the realms of Physical Science.

Our last LAP dealt with the study of the nature of magnetism and electricity and their relationship.

In this LAP we will be concerned with two other interesting aspects of Physical Science "Sound and Light." We will consider in our study of sound its nature, how it is produced, measured and how we are able to hear sound. In our study of light we will consider its nature, source, significance and how we are able to see light. I hope you have enjoyed your adventure through Physical Science and as you continue on to Biology and Chemistry I truly hope that some of the experiences you have encountered will be of help to you.

and good luck in your future endeavors.

Section I

Behavioral Objectives:

Using the prescribed resources you will on the Progress and/or LAP Test be able to:

1. State the scientific meaning for the term light.
2. Name the basic source of light in our universe and list four things that would probably happen if this basic source of light was suddenly cut off.
3. List the names of four different kinds of light.
4. Using the terms absorb, reflect and transmit state their relationship to the following terms:
   1. Transparent material
   2. Opaque material
   3. Translucent material
5. State the meaning, cause, kinds and the affects of the reflection of light.
6. List the characteristics which makes materials or objects good reflectors of light.
7. List the names of four good reflectors and four poor reflectors of light.
8. State the meaning, cause and effect of the refraction of light.
9. Name the basic parts of a light bulb and state how it produces light.
10. State generally how each of the following produces light.
    1. Sun 2. Moon 3. Match 4. Fireflies 5. Lightening
11. Contrast the following: 1. velocity of light and velocity of sound.
    2. How light waves travel and how sound waves travel.

Resources Section I

1. Energy and the Atom
   Topics: 1. For Interaction and Learning page 242
   2. Pro and Con pages 249-250
   3. Interference pages 250-251

2. The Physical World
   Topics: 1. Light-What It Is and What Is Does pages 399-400
   2. How Does Light Help Us to See and Object pages 401-402
   3. Light Does Not Always Bounce pages 402-403
   4. Some Mirrors Can Fool You pages 403-404
   5. Bent Light Rays Can Fool You page 406
   6. What Is Light page 433
   7. Light's Strange Behavior pages 433-437
   8. Explaining Refraction page 437-438

3. Science: A Key to the Future
   Topics: 1. Kinds of Light page 171-173
   2. Reflection page 174
   3. Mirror Surfaces page 174-176
   4. Refraction page 176-177
   5. Controlling the Color of Light page 183-184

4. Pathways In Science (Sound and Light)
   Topics: 1. The Nature of Light page 87-88
   2. When Light Strikes An Object pages 89-90
   3. Light Bounces Back pages 91-92
   4. The Travels of Light page 95
   5. What Is Light page 100
   6. When Light Looks Back pages 111-113
   7. Reviewing the Speed of Light pages 125-126

5. The World Book Encyclopedia- Volume 12 Book L
   Topics: 1. Light Page 248
   2. The Nature of Light page 248
   3. Sources of Light page 250
   4. Reflectors and Refractors page 253
   5. Sources of Light page 254-255

HANDOUTS

1. Terms to define related to the study of light
2. A worksheet to complete on Research Information on Light
3. Chart to complete on good and poor reflectors of light
4. Diagram illustrating the basic parts of a light bulb

Tapes and Audio-Visuals
   Lecture- The Nature of Light

Film and Filmstrips
   1. Light
   2. Light In Your Homes

ACTIVITIES

Transparencies

1. What Is Light (Complete student activities)
2. Sources of Light (Complete student activities)
3. Nature of Light (Complete student activities)
4. Reflection of Light (Complete student activities)
5. Refraction of Light (Compelte student activities)
6. Light and Materials (Compelte student activities)

Self-Evaluation

1. Write a brief definition for the term light:

2. List four things that would probably happen if the sun would stop shining:

   1.

   2.

   3.

   4.

3. Circle the basic source of light in the universe.

   (a) moon (b.) light bulb (c) sun (d) lamps

4. _____ and _____ are two different kinds of light.

5. When light strikes an object the light maybe_____

   _____, or_____

6. Match the following:

_____ 1. Opaque objects	a.	transmit light
_____ 2. Transparents objects	b.	stops light
_____ 3. Translucent objects	c.	transmits some of the light

7. Differentiate between the terms.

   1. Reflection (of light)

   2. Refraction (of light)

8. State two characteristics which makes objects good reflectors of light.

   1. 2.

9. Name two good reflectors of light.

   1. 2.

10. Name two poor reflectors of light.

    1. 2.

11. What causes the reflection of light?

12. What causes the refraction of light?

Self-Evaluation (cont')

13. Briefly explain how a light bulb produces light.

14. Explain how light is produced by the following:

    1. lightning
    2. Sun
    3. Moon
    4. Match

15. Which travels fastest light or sound?

16. Why do you see lightning before you hear thunder even though they occur at the same instant?

17. How long does it take light from the sun to reach us?_____

    From the moon?_____

18. How long does it take light to travel around the earth?

19. What is the speed of light through the air?_____

20. Can light travel through a vacuum?

    If so why?

    If not why?

Advanced Study

1. Each term in the following list is a key word or phrase in the section of this LAP that you have completed. Compose a short summary of your understanding of these concepts.
    1. Transparent
    2. Opaque
    3. Absorb
    4. Refraction
    5. Reflection
2. Explain why it is better to have your reading lamp behind you or to one side rather than directly over your book.
3. Explain why a book is easier to read when it is printed on paper with no glare than when printed on shiny or glossy paper.
4. Using lines and arrows illustrate what happens to a beam of light when it strikes transparent, translucent, and opaque materials.
5. Using lines and arrows contrast what happens when a beam of light strikes a smooth and a rough surface.

Section II

Behavioral Objectives:

Using the prescribed resources you will on the progress and/or LAP test be able to:

1. State the scientific meaning and significance of photosynthesis.
2. Name the basic source of energy used by plants in the photosynthesis process.
3. Step by step outline what happens during the photosynthesis process.
4. Write and interpret the equations which represents what happens during photosynthesis.
5. State the role each of the following plays in photosynthesis.
   1. CO_2
   2. H_2O
   3. Light energy
   4. Glucose
   5. O_2
   6. Soil
   7. Chlorophyll
   8. Leaf blade
   9. Stoma
   10. Roots
   11. Stem
   12. Sun
6. Name the basic parts of the human eye.
7. State the function for each part of the eye.
8. Trace the path of light from the time it enters the eye until it reaches the brain where it is interpreted.
9. State the cause and effects of nearsightedness and farsightedness.
10. State how nearsightedness and farsightedness conditions may be corrected.
11. List the effects that improper lighting may have on the eyes over a long period of time.

Resources Section II

1. Energy and the Atom
   Topics: Photosynthesis pages 263-286

2. The Physical World
   Topics: 1. How Your Eye Sees page 409
   2. What Is Inside Your Eye pages 409-410
   3. The Retina and Lenses pages 410-411
   4. How You Focus Your Eyes pages 413-414
   5. Why You May Have to Wear Glasses pages 414-415
   6. Regulating the Amount of Light pages 415-416

3. Science: A Key to the Future
   Topics: 1. The Needs of Green Plants page 427
   2. Photosynthesis page 427
   3. Glucose page 427
   4. The Chemical Equation for Photosynthesis page 427
   5. Three Major Steps page 428
   6. Leaf Cells page 436
   7. Plant Roots page 437
   8. Passage of Materials in Leaves pages 439-440
   9. The Eye page 180
   10. Optics of the Eye page 180-181
   11. The Retina pages 181-182
   12. The Eye and the Brain pages 182-183
   13. Controlling the Color of Light pages 183-184

4. Modern Physical Science
   Topics: 1. Your Eye is Natures own Camera pages 327-328
   2. The Lens of Your Eye is Flexible pages 328-329
   3. Carbon Dioxide is Necessary For Plants pages 40-41

5. Pathways In Science (Sound and Light)
   Topics: 1. *The Human Eye At Work pages 103-104
   2. Out of Focus pages 105-106
   3. Images in Our Eye pages 133-134
   4. *When Eyes Are Out of Focus pages 134-135

6. The World Book Encyclopedia Volume 12 Book L
   Topics: 1. The Leaf As A Food "Factory" pages 134-135
   2. Chlorophyll page 135
   Volume 15 Book P
   Topics: 1. Photosynthesis page 382

Tapes and Audio-Visuals
1. Wallensak Teaching Tape
   Photosynthesis (Complete the Worksheet)

Resources (cont')

Filmstrips

1. Plants-Nature's Food Factories
2. How We See
3. The Eye and The Camera
4. Photosynthesis
5. Food From The Sun

Handouts

1. List of terms to define related to the study of photosynthesis.
2. A diagram of a plant to lable parts and state the function of parts (refer to objective 5)
3. A diagram of the eye to lable the parts and state the function for each part.

Activities

I. Using the Energy and The Atom Book pages 287-288 Answer questions 1-14 Under the topic "Self Testing Quiz."

II. Complete the matching exercise on page 339. In The Modern Physical Science textbook under the topic chapter review vocabulary.

Advanced Study

1. Each term in the following list is a key word used in this section of the LAP. Compose a short summary of your understanding of these concepts.

   1. Iris
   2. Pupil
   3. Cornea
   4. Lens (of the eye)
   5. Retina
   6. Focus
   7. Nearsightedness
   8. Farsightedness
   9. Astigmatism

2. Make a chart which displays the "Needs of Green Plants."

3. Using a diagram illustrate what happens during the process of photosynthesis. Include the role that each of the following plays.

   1. Water
   2. Carbon Dioxide
   3. Sunlight
   4. Chlorophyll
   5. Glucose
   6. Oxygen

4. Make a large illustration of the human eye, label the parts, state the function of each part and explain how we are able to "see."

Self-Evaluation Section II

1. What is meant by the term photosynthesis?

2. What is the basic source of energy used in the process of photosynthesis?_____

3. What is the basic raw materials used in the process of photosynthesis?

_____ and_____

4. Write the equation which represents the photosynthesis process.

5. What role does each of the following play in photosynthesis?

1. Glucose	6. Stoma
2. CO_2	7. Veins
3. H_2O	8. Leaf
4. Sunlight	9. Stem
5. Oxygen	10. Root

6. How do green plants obtain food during the winter months?

7. List the names of the basic parts of the human eye and state their function.

8. Trace the path of light from the time it enters the eye until it reaches the brain.

9. Differentiate between the following conditions:
   1. Nearsightedness
   2. Farsightedness

10. State how these conditions may be corrected.

Section III

Behavioral Objectives:

Using the prescribed resources you will on the progress and/or LAP test be able to:

1. State the scientific meaning for sound.
2. State basically how sound is produced.
3. List and define the names of five different kinds of sound.
4. State how sound travels and what is necessary for sound to travel.
5. List the names of three good conductors of sound.
6. List two factors which influences the speed of sound.
7. Contrast the velocity of sound waves in different media. Examples-air, water, and steel)
8. List three distinguishing characteristics of sound.
9. Demonstrate how we can create visible waves and identify the following parts.
    1. wavelength
    2. Amplitude
    3. Medium
    4. Frequency
10. Distringuish between and state examples for sound and sound refraction.
11. State characteristics which make materials good and poor relectors of sound.

Resources Section III

1. Energy and The Atom
   Topics: 1. What Is Sound pages 172-173
   2. Vibration pages 174-175
   3. Velocity of Sound pages 184-185

2. Modern Physical Science
   Topics: 1. *Energy and Sound page 282
   2, *Matter is Necessary for Sound to be produced pages 282-283
   3. *Wave Characteristics pages 284-285
   4. Why does the speed of Sound Through Different Media Vary pages 288-289
   5. *How sound Waves Pass Through Matter page 288

3. The Physical World
   Topics: 1. *Our Sound Filled World page 492
   2. *Vibrations pages 492-494
   3. *The Speed of Sound pages 494-497
   4. Pitch pages 497-498
   Loud and Soft pages 498-499

4. Science: A Key to the Future
   Topics: 1. *Vibrations of Matter pages 124-125
   2. Effects of Temperature and Altitude page 125
   3. *Effect of a Vacuum on Sound page 124

5. Pathways In Science (Sound and Light)
   Topics: 1. Sounds of Our World page 23
   2. *Where There is Sound, There Is Motion page 23-24
   3. *How does the Number of Vibrations change Sound page 25
   4. *Vibration Frequency page 25
   5. *Sound Make Waves page 26
   6. *The Travels of Sound pages 29-30
   7. *How Fast Does Sound Travel page 30
   8. *When Sound Reaches a Surface and Bounces Back pages 31-32

6. The World Book Encycolpedia
   Volume Book S
   Topics: 1. *What is Sound page 488
   2. *Producing Sound page 488
   3. Sound Waves pages 488-489
   4. *How Sound Travels page 489
   5. Characteristics of Sound page 489
   6. *Kinds of Sound page 493
   7. *Sound Travels At Different Speeds page 491

* These are required to read

Handouts

1. Terms to define related to this section of the LAP.
2. Chart to complete on the velocity of sound through different media.
3. Diagram of a wave to lable the basic parts listed in Behavioral Objective 9

Resources (cont')

Tapes and Audio Visuals

1. Wollensak Teaching Tape
   "The Nature of Sound" C-7550 (Complete the worksheet)

Film and Filmstrips

1. Sound (Complete the questions given on the filmstrip set I and set II.)

ACTIVITIES Transparencies

1. What Is Sound (Complete Student activities)
2. Nature of Sound (Complete Student Activities)
3. Characteristics of Sound (Complete Student Activities)
4. Sound and Materials (Complete Student Activities)
5. Using the Modern Physical Science textbook-answer the following questions on page 293-294 1,2,3,4,5,6, 7,9, and 12.
6. Using the Modern Physical Science textbook pages 305-306 answer the follwing questions 2,3,4,5,8- from questions Group A and 1,5,6, from questions Group B

Experiments

I. Wave motions (Directions found page 493 of Physical World Textbook.

II. Perform the experiment on the following pages of your textbook page 174,175, 177, 197 (Energy and The AtoM)

Advanced Study

1. Each of the following terms are related in someway to the study of sound. Compose a short summary of your understanding of these concepts.
   1. Echo
   2. Ultrasonic sounds
   3. Stereophonic sound
   4. Vibration
   5. Frequency
   6. Pitch
   7. Acoustics
   8. Decibels
   9. Loudness
2. Make a list of at least five sound instruments and state what purpose they serve.
3. Make a chart contrasting the following.
   The velocity of (a) sound (b) light
   (a) How light travels (b) How sound travels
   (a) Light traveling through a vacuum (b) Sound traveling through a vacuum
   (a) Light reflection (b) Sound reflection
4. Solve the following problems
   1. Approximately how far away is a boat if you see the steam from its whistle 4.5 seconds before you hear it?
   2. If you hear thunder 8 seconds after you see the lightening flash, about how far away is the thunderstorm?
5. Write a report on the following topic: Bats and A New Science Ultrasonics.

Self-Evaluation Section III

1. Define sound.

2. State one term which basically summarizes how sound is produced. _____

3. Name three different kinds of sounds.

   1.

   2.

   3.

4. How does sound travel?

5. Does sound need a medium through which to travel.___

   If so why?

   If not explain.

6. Can sound travel through a vacuum?

7. How does sound and light differ in their means of travel?

8. Name two good conductors of sound.

   1. 2.

9. What are two factors which influences the speed of sound?

   1 2.

10. Through which will the speed of sound travel fastest, steel, air, or water?_____

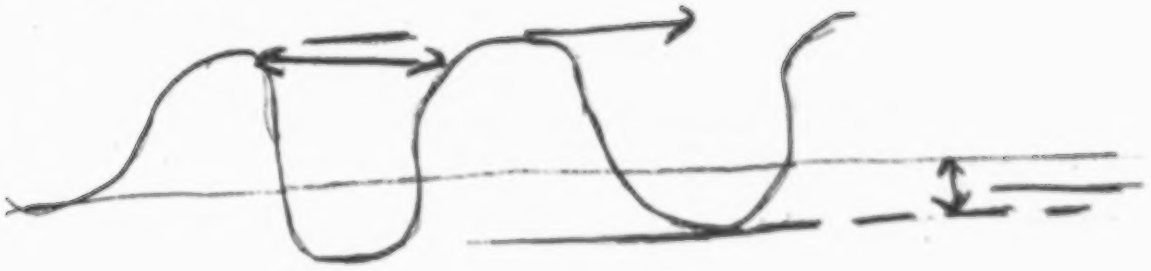
    Explain your answer.

11. What distinguishes sound from noise?

12. Using the proper terms lable this diagram which represents A sound wave.

Self-Evaluation (cont')

12. (cont')



13. Distinguish between the following terms.

    1. Sound reflection

    2. Sound refraction

14. How does the number of vibrations change sound?

15. What is the velocity of sound through air.

Section IV

Behavioral Objectives:

Using the prescribed resources you will on the progress and/or LAP Test be able to:

1. List the names of the basic parts of the outer, middle and inner ear.
2. State the function of each part of the outer, middle and inner ear.
3. Trace the path of sound from the outer ear to the brain where it is interpreted.
4. Differentiate between the terms loudness and intensity of sound.
5. List the name of the instrument and unit sound engineers use to measure sound.
6. Contrast several examples of loudness of sounds. Example.

Sound	Decibels
Silence	0
Whisper	10-20

7. State what determines the pitch and loudness of sound.
8. State the relationship of the following terms to sound.
   1. Microphone
   2. Megaphone
   3. Stethoscope
   4. Acoustics
   5. Oscilloscope
9. Using the terms voicebox, vocal cord and wind pipe etc., state how we are able to produce sound.
10. State the meaning, significance and future uses for ultrasonics.

1. Energy and The Atom
   Topics: 1. Frequency pages 176-177
   2. *Pitch page 177
   3. *Amplitude and Loudness pages 178-179
   4. Frequency, Period, Amplitude pages 182-183
   5. *Sound From The Voice pages 201-202
   6. *Vocal Organs pages 202-204
   7. *A Voice of Your Own and Other Animals pages 204-205
   8. *Hearing Sound pages 211-212
   9. *The Ear pages 212-224
   10. *Measuring Sound pages 226-227

* (Required Reading)

2. Modern Physical Science
   Topics: 1. *The Sensation of Sound is Produced in the Brain page 289
   2. *What Determines the Pitch of Sound pages 289-290
   3. *What Determines the Loudness of Sound pages 292-293

3. The Physical World
   Topics: 1. How we Hear pages 500-504

4. Pathways In Science (Sound and Light)
   Topics: 1. *The Human Ear pages 34-35
   2. The Sounds We Cannot Hear pages 35-36
   3. *The Human Voice page 40
   4. How Do Sounds Differ page 47
   5. *Play It Louder pages 48-49
   6. *Making Sounds Louder pages 50-51
   7. Making Sounds Softer pages 50-51

Handouts
1. Terms to define related to the study of sound.
2. Diagram of the ear-to lable parts and state the function of the parts.
3. Diagram to trace the path of sound from the outer ear to the brain.
4. Chart to complete contrasting the loudness for different sounds.

Tapes and Audio-Visuals
1. Wallensak Teaching Tape
   "How We Hear" C-7058 Complete work sheet

Film and Filmstrips
"How We Hear"

Activities (Transparencies)
1. Man's Voice (Complete Student Activities)
2. Animal Sounds and Hearing (Complete Student Activities)

Resources (cont')

Using the Modern Physical Science Textbook pages 304-305

Complete the Matching exercise.

Experiments

Use your textbook for procedures pages 221,222,225,227.

Advanced Study

1. Each of the following terms are related to this section of the LAP. Compose a short summary of your understanding of these concepts:

    1. Noise
    2. Eardrum
    3. Cochlea
    4. Auditory nerve
    5. Hammer
    6. Anvil
    7. Stirrup
    8. Semicircular canals

2. Make a report on several causes and cures for deafness.

3. Submit a summary on How Sound Can Be Measured.

4. State differences between conduction deafness and nerve deafness.

5. Compare how you hear with how four other different animals hear.

6. Explain the following concepts:

    1. Sound does not travel through a vacuum.

    2. You see lightning before you hear thunder, even though both occur at the same time.

    3. Children voices are higher pitched than men's voices.

    4. Some sounds are pleasant to our ears, while other sounds are unpleasant.

Self-Evaluation Section IV

1. Name the three basic regions of the ear.

   1.
   2.
   3.

2. State the function for the following parts of the ear:

   1. Semicircular canals

   2. Outer ear

   3. Ear drum

   4. Hammer, anvil and stirrup

   5. Auditory nerve

3. Trace the path of sound from the outer ear until it reaches the brain:

4. What is the difference between the following terms?

   a. Loudness of sound

   b. Intensity of sound

   A. Frequency

   B. Pitch

5. What unit may be used to express the loudness of sound?_____

6. Basically what determines the pitch and loudness of sound?_____

7. Name the three different kinds of sound instruments and state their purpose and how they operate.

   NAME FURPOSE

   1.
   How it operates

   2.
   How it operates

   3.
   How it operates

8. Explain how we are able to produce sounds.

Self-Evaluation (cont')

9. What is meant by the terms
   (a) Ultrasonic

   (b) Acoustics

10. Explain how scientists predict the study of ultrasonics will be of help to us in the future.

11. How may sounds differ?

12. How may sounds be made louder?

    Softer?